

## Queue Solutions

### Solution 1 :

Time Complexity :  $O(n)$

Space Complexity:  $O(n)$

```
import java.util.LinkedList;
import java.util.Queue;
```

```
public class Solution {
    static void generatePrintBinary(int n){
        Queue<String> q = new LinkedList<String>();
        q.add("1");
        while (n-- > 0) {
            String s1 = q.peek();
            q.remove();
            System.out.println(s1);
            String s2 = s1;
            q.add(s1 + "0");
            q.add(s2 + "1");
        }
    }

    public static void main(String[] args){
        int n = 10;
        generatePrintBinary(n);
    }
}
```

### Solution 2 :

Time Complexity :  $O(n)$

Space Complexity:  $O(n)$

```
import java.util.*;
```

```
class Solution{
    static int minCost(int arr[], int n){
        PriorityQueue<Integer> pq
            = new PriorityQueue<Integer>();

        for (int i = 0; i < n; i++) {
            pq.add(arr[i]);
        }

        int res = 0;
        while (pq.size() > 1) {
            int first = pq.poll();
            int second = pq.poll();
            res += first + second;
            pq.add(first + second);
        }
        return res;
    }

    public static void main(String args[]){
        int len[] = { 4, 3, 2, 6 };
        int size = len.length;
        System.out.println("Total cost for connecting"
            + " ropes is "
            + minCost(len, size));
    }
}
```

### Solution 3 :

Time Complexity :  $O(n \log n)$

Space Complexity:  $O(n)$

```
import java.util.*;
```

```
class Solution {
    static class Job {
        char job_id;
        int deadline;
        int profit;
```

```
Job(char job_id, int deadline, int profit){
    this.deadline = deadline;
    this.job_id = job_id;
    this.profit = profit;
}

}

static void printJobScheduling(ArrayList<Job> arr){
    int n = arr.size();
    Collections.sort(arr, (a, b) -> {
        return a.deadline - b.deadline;
    });
    ArrayList<Job> result = new ArrayList<>();
    PriorityQueue<Job> maxHeap = new PriorityQueue<>(
        (a, b) -> { return b.profit - a.profit; });
    for (int i = n - 1; i > -1; i--) {
        int slot_available;
        if (i == 0) {
            slot_available = arr.get(i).deadline;
        }
        else {
            slot_available = arr.get(i).deadline
                                - arr.get(i - 1).deadline;
        }
        maxHeap.add(arr.get(i));
        while (slot_available > 0
            && maxHeap.size() > 0) {
            Job job = maxHeap.remove();
            slot_available--;
            result.add(job);
        }
    }

    Collections.sort(result, (a, b) -> {
        return a.deadline - b.deadline;
    });

    for (Job job : result) {
        System.out.print(job.job_id + " ");
    }
}
```

```
        System.out.println();
    }

    public static void main(String[] args){
        ArrayList<Job> arr = new ArrayList<Job>();

        arr.add(new Job('a', 2, 100));
        arr.add(new Job('b', 1, 19));
        arr.add(new Job('c', 2, 27));
        arr.add(new Job('d', 1, 25));
        arr.add(new Job('e', 3, 15));

        System.out.println("Following is maximum "
                           + "profit sequence of jobs");
        printJobScheduling(arr);
    }
}
```

#### Solution 4 :

Time Complexity :  $O(n+k)$

Space Complexity:  $O(k)$

```
import java.io.*;
import java.util.*;
```

```
import java.util.*;
```

```
class Solution {
```

```
    static class cell {
        int x, y;
        int dis;
        public cell(int x, int y, int dis){
            this.x = x;
            this.y = y;
            this.dis = dis;
        }
    }
```

```
    }
}

static boolean isInside(int x, int y, int N){
    if (x >= 1 && x <= N && y >= 1 && y <= N)
        return true;
    return false;
}

static int minStepToReachTarget(
    int knightPos[], int targetPos[],
    int N){
    int dx[] = { -2, -1, 1, 2, -2, -1, 1, 2 };
    int dy[] = { -1, -2, -2, -1, 1, 2, 2, 1 };

    Vector<cell> q = new Vector<>();
    q.add(new cell(knightPos[0], knightPos[1], 0));
    cell t;
    int x, y;
    boolean visit[][] = new boolean[N + 1][N + 1];
    visit[knightPos[0]][knightPos[1]] = true;
    while (!q.isEmpty()) {
        t = q.firstElement();
        q.remove(0);
        if (t.x == targetPos[0] && t.y == targetPos[1])
            return t.dis;
        for (int i = 0; i < 8; i++) {
            x = t.x + dx[i];
            y = t.y + dy[i];
            if (isInside(x, y, N) && !visit[x][y]) {
                visit[x][y] = true;
                q.add(new cell(x, y, t.dis + 1));
            }
        }
    }
    return Integer.MAX_VALUE;
}

public static void main(String[] args){
    int N = 30;
```

```

        int knightPos[] = { 1, 1 };
        int targetPos[] = { 30, 30 };
        System.out.println(
            minStepToReachTarget(
                knightPos, targetPos, N));
    }
}

```

### Solution 5 :

Time Complexity :  $O(n)$

Space Complexity:  $O(k)$

```

import java.util.Deque;
import java.util.LinkedList;

```

```

public class Solution {

    static void printMax(int arr[], int n, int k){

        Deque<Integer> Qi = new LinkedList<Integer>();
        int i;
        for (i = 0; i < k; ++i) {
            while (!Qi.isEmpty() && arr[i] >=
                arr[Qi.peekLast()])
                Qi.removeLast();
            Qi.addLast(i);
        }
        for (; i < n; ++i) {
            System.out.print(arr[Qi.peek()] + " ");
            while ((!Qi.isEmpty()) && Qi.peek() <=
                i - k)
                Qi.removeFirst();
            while ((!Qi.isEmpty()) && arr[i] >=
                arr[Qi.peekLast()])
                Qi.removeLast();
            Qi.addLast(i);
        }
        System.out.print(arr[Qi.peek()]);
    }
}

```

```
public static void main(String[] args){  
    int arr[] = { 12, 1, 78, 90, 57, 89, 56 };  
    int k = 3;  
    printMax(arr, arr.length, k);  
}  
}
```

